TITLE

LINE TENSIONING DEVICE AND METHODS

FIELD OF THE INVENTION

The invention relates to a device for tensioning lines such as rope and the like and methods for tensioning ropes using the device.

BACKGROUND TO THE INVENTION

For many people securing and tensioning lines, such as ropes can be difficult due to the need to tie secure knots in the rope to achieve the desired tension. Often a device or apparatus is used to aid in tensioning the rope, but many of these, such as that disclosed in United States Patent 5,803,209, require the rope to be secured or knotted at least at one end of the rope if not both.

Another type of rope tensioning apparatus is disclosed in Australian Patent 610539. However, one problem associated with this rope tensioning apparatus is the lack of tension obtained. This apparatus also requires the rope to be tied off before tensioning can be carried out. Furthermore, this rope tensioning apparatus is quite complex and thus proportionally costly to manufacture.

Generally, many of the prior art rope tensioners have the disadvantage that unless the user is proficient in tying knots the rope will not be secure and it is difficult to achieve the desired tension.

Hence, there is a need for a line tensioning device and/or method that addresses or at least ameliorates one or more of the aforementioned problems of the prior art. It is desirable that such a line tensioning device and/or method

tensions a line without the need for a user to tie a knot in the line to be tensioned.

SUMMARY OF THE INVENTION

In one form, although it need not be the only or indeed the broadest form, the invention resides in a line tensioning device comprising:

an elongate body having a line locating region; and

a hook at a first end of the elongate body;

wherein, said hook maintains the line tensioning device in position after rotation of the device to achieve a desired tension in said line.

Preferably, the device further comprises at least one aperture through the elongate body. The at least one aperture is preferably through the line locating region of the elongate body.

Preferably, the device further comprises at least one locking means for securing in position the line passing through one of the apertures.

Preferably, the locking means comprises a manually operated, pivotally mounted lever accommodated in a slot in the elongate body. Preferably, the lever is biased towards a closed position by a biasing means.

Preferably, the lever comprises a serrated end for engaging the line.

Suitably, the serrated end comprises a tooth that protrudes further from the end of the lever than remaining teeth of the serrated end.

In another form, the invention resides in a method of tensioning a line, said method including the steps of:

locating part of the line about a line locating region of an elongate body of a line tensioning device;

rotating the line tensioning device in a first direction of rotation until a desired tension is achieved in the line; and

maintaining the desired tension via a hook at a first end of the elongate body, said hook engaging the line and preventing rotation of the line tensioning device in a second direction of rotation opposite to the first direction of rotation.

Suitably, locating part of the line includes the step of:

threading an end of the line through an aperture in the line locating region; and/or

looping the line at least once around the line locating region.

Further features of the present invention will become apparent from the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

To assist in understanding the invention and enabling a person skilled in the art to put the invention into practical effect preferred embodiments of the invention will be described by way of example only with reference to the accompanying drawings, wherein:

FIG 1 shows a plan view of the line tensioning device according to an embodiment of the present invention;

FIG 2 shows an underside view of the line tensioning device shown in FIG 1;

FIG 3 shows a side view of the line tensioning device shown in FIG 1;

FIG 4 shows a view of a first end of the line tensioning device shown in FIG 1;

FIG 5 shows a view of a second end of the line tensioning device shown in FIG 1;

FIG 6 shows a sectional side view of the line tensioning device shown in FIG 1;

FIG 7 shows a sectional side view of the line tensioning device shown in FIG 1 engaging two ends of a line;

FIG 8 is a perspective view of the device shown in FIG 1 being used with a line having two free ends;

FIG 9 is a perspective view showing excess slack in the line being taken up during use of the device shown in FIG 1;

FIG 10 is a perspective view showing rotation of the device of FIG 1 to increase tension in the line;

FIG 11 is a perspective view showing the device of FIG 1 secured in place with a tensioned line;

FIG 12 is a perspective view showing the device of FIG 1 being used to tension a line having no free ends;

FIG 13 is a perspective view showing the device of FIG 1 being secured in place on the tensioned line; and

FIG 14 is a flowchart showing the method steps in tensioning a line using the device of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIGS 1-7, the line tensioning device 10 according to one embodiment of the present invention comprises an elongate body 12 having a line locating region 13 substantially centrally thereof and a hook 14 at a first end

16 of the elongate body 12. The line locating region 13 is a region of the body of reduced thickness compared with the remainder of the body and forms a "waist" of the body 12. The hook 14 may be integrally formed with the body 12 or formed separately therefrom and attached by any suitable means known in the art.

With reference to FIGS 1, 2, 6 and 7, the elongate body 12 comprises at least one aperture 18 therethrough, through which a free (untied) end 20 of a line 22 to be tensioned can be passed. The apertures are sized such that lines of a range of thicknesses and diameters can be passed therethrough. In the embodiment shown, the elongate body 12 comprises two apertures 18 therethrough to enable the tensioning of a line 22 with two free ends. The present invention may also be used to tension a line that is tied at both ends, i.e. having no free (untied) ends.

The line tensioning device 10 further comprises locking means 24 for securing in position a line 22 passing through one of the apertures 18. Locking means 24 comprises a pivotally mounted, manually operated lever 26 located in a slot 28. With reference to FIG 6, lever 26 pivots about pivot point 30 between an open position and a closed position. The closed position of lever 26 is shown in FIG 6 in solid lines and the open position of lever 26 is shown in broken lines with the directions of motion indicated by the arrows. Lever 26 is biased in the closed position by a biasing means 32. In one embodiment, biasing means 32 is in the form of a mechanical spring, although other forms of biasing means are envisaged, such as an integral plastics hair spring formed as part of the lever 26. Biasing means 32 are positioned via locating recesses (not shown) in the elongate body 12 and the levers 26.

With reference to FIGS 3, 6 and 7, an upper profile 33 of the lever 26 conforms to an upper profile 35 of the elongate body 12 apart from a raised portion 34 of the lever 26 at an end of the lever nearest the pivot point 30. Raised portion 34 allows a user to easily move the lever 26 against the biasing means 32 from the closed position to the open position. Raised portion 34 also renders use of levers of the device clear to a user.

At an end of the lever 26 opposite the raised position 34, lever 26 comprises a toothed or serrated end 36 for engagement with the line 22 passing through aperture 18. Elongate body 12 also comprises a post 38 separating apertures 18. Hence, with reference to FIG 7, a line 22 passing through aperture 18 of the device is held securely in place by the locking means 24. This is achieved by biasing means 32 urging lever 26 toward the closed position such that the serrated end 36 engages the line 22 and forces the line against the post 38.

The pivot point 30 for lever 26 is located at a point along the length of the lever such that the serrated end 36 of the lever achieves a relatively shallow angle of attack with respect to the line 22. This enables a range of line thicknesses to be accommodated by the present invention and provides a positive lock on the line as it is tensioned. As the line is tensioned, the line causes the lever 26 to pivot about point 30, thus drawing in the serrated end 36 resulting in line 22 being locked between lever 26 and post 38.

The lowest tooth 40 of the serrated end 36 protrudes further than the remaining teeth such that the lowest tooth 40 is the first tooth to engage the line 22 passing through the aperture 18 irrespective of the line thickness. The serrated end 36 is also gently curved to maximize the number of teeth in

engagement with the line 22.

The tensioning of lines using the line tensioning device 10 of the present invention will now be described with reference to FIGS 8-14.

With reference to FIGS 12 and 13, where a line 22 is tied at both ends such that there are no free ends, the line may still need to be tensioned. In this case, part of the line 22 is looped around the line locating region 13 of the elongate body 12 such that at least one full turn passes around the line locating region 13. The line tensioning device 10 is then rotated in a first, clockwise direction, thus twisting the line and increasing the tension therein, until a desired tension is achieved. The desired tension is maintained in the line by deforming the line 22 past the first end 16 of the body 12 and the hook 14 engaging the line. The line naturally wants to unwind in an anticlockwise direction to release the tension in the line, but the line is prevented from doing so by the hook 14. The reduced thickness of the line locating region 13 relative to the remainder of the body 12 helps prevent the line 22 from slipping along the body 12 because the line is tightened around the narrower region 13 and is unable to move to the thicker regions of the body 12.

FIGS 8-11 illustrate the tensioning of a line having two free ends, but also assist in the understanding of tensioning a line having only a single free end.

Where a line is tied at one end such that there is one free end, the free end is passed through aperture 18. Where two apertures 18 are provided in the device 10 and one free end of the line 22 is available, generally the aperture closer to the first end 16 of the elongate body 12 comprising the hook 14 is utilized, although the invention functions equally well using either aperture. As shown in FIG 9, excess slack in the line 22 is taken up by pulling the free end

through the aperture 18 and the locking means 24 prevents the line 22 from slipping back through the aperture. The line is then looped around line locating region 13 and the device is rotated clockwise, as described in the previous example, until a desired tension in the line 22 is achieved. Untwisting of the line is prevented by the hook 14 securing the device 10 in place.

Where there are two free ends of the line 22 to be tensioned, each end is passed through a respective aperture 18 of the device, as shown in FIG 8, and the excess slack is taken up as described above with reference to FIG 9. The device 10 is rotated clockwise as shown in FIG 10 until a desired tension in the line 22 is achieved. Untwisting of the line is prevented by the hook 14 securing the device 10 in place as shown in FIG 11.

The device 10 may be produced by injection moulding using glass-filled nylon, which is hard wearing and is resistant to degradation from UV radiation. However, other suitable materials known in the art may be utilized.

In one embodiment, the length of the elongate body 12, apart from the line locating region 13, is ribbed to provide grip. Ribbing also reduces the mass of material required for the device and therefore the cost of production. Ribbing has the further advantage that it increases the surface area of the device thus decreasing cooling times in the injection moulding process and therefore reducing production times.

Another cost-minimizing feature of the present invention is the symmetrical nature of the elongate body 12 and the mirror image nature of the levers 26, i.e. differently shaped levers 26 do not need to be produced for the embodiment comprising two levers.

Hence, the line tensioning device of the present invention addresses the

aforementioned problems of the prior art by providing an elongate body comprising a line locating region about which a line to be tensioned is located. This is achieved by looping the line around the line locating region and/or threading one or more ends of the line through one ore more apertures in the line locating region. Rotation of the device enables the desired tension to be achieved and a large amount of tension can be achieved through relatively little effort. Untwisting of the tensioned line is prevented via the hook at the end of the elongate body. The device does not require the user to tie any knots in the line to be tensioned nor does the device require a large amount of effort from the user to achieve the desired tension.

Furthermore, the device of the present invention is relatively simple compared with the aforementioned prior art and the device comprises the aforementioned features to minimize the cost and duration of production.

Whilst the present invention has been described in use by rotating the device clockwise, it will be appreciated that a mirror image of the hook 14 could be employed at the first end 16 of the body 12, which would require rotation of the device anti-clockwise to increase the tension in the line and enable securing of the tensioned line by the hook 14.

The provision of two locking means 24 in an embodiment of the invention enables ends of lines of different thicknesses and/or materials to be securely received and tensioned. The securing of one line by one lever is independent of the securing of another line by another lever, hence lines of different thicknesses can be passed through the respective apertures 18 and tensioned. The inventor has also found that the device of the present invention does not damage the line being tensioned even after prolonged and repeated tensioning of the same line.

The line tensioning device of the present invention has many applications since it may be used to tension lines secured at both ends or with lines having one or more free ends. Examples include securing loads on trailers, utility vehicles, trucks or the like, outdoor activities such as camping or for clamping components together, such as during gluing.

It will be realized that the rope tensioning device according to the invention is not restricted to the methods as shown in the examples, but may be used in a combination of the described methods or any other suitable arrangement.

Throughout the specification the aim has been to describe the invention without limiting the invention to any one embodiment or specific collection of features. Persons skilled in the relevant art may realize variations from the specific embodiments that will nonetheless fall within the scope of the invention.